

# HAZUS User Group Success Story

## Using HAZUS for Flood Loss Estimates and CRS Flood Mitigation Planning

In April 2008 the City of Savannah, Georgia embarked on a mission to prepare a comprehensive upgrade to their existing Flood Hazard Mitigation Plan. The principal goals of the project were: (1) to assess and quantify current flood hazard risks using new geospatial data and best available technology; (2) to increase public and stakeholder involvement in the City's mitigation planning efforts; and (3) to maximize potential credit points under FEMA's Community Rating System (CRS) through quality plan development and implementation. These goals were achieved in large part due to the use of HAZUS.



## Assessing and Quantifying Flood Hazard Risk with HAZUS

The flood loss estimation methodology consisted of two components that carried out basic analytical processes: flood hazard analysis and flood loss estimation analysis. The flood hazard analysis module used characteristics, such as frequency, discharge, and ground elevation to estimate flood depth, flood elevation, and flow velocity. The flood loss estimation module calculated potential loss estimates from the results of the hazard analysis. The potential loss estimates analyzed through this process included:

- Physical damage to residential, commercial, industrial and other buildings
- Debris generation, including the distinction between different types of materials;
- Economic loss, including lost jobs, business interruptions, repair and reconstruction costs
- Social impacts, including estimates of shelter requirements, displaced households, and population exposed to scenario floods

Savannah's GIS-based flood risk assessment was completed using the best data made available at the time of the analysis. Digital data was collected from local, regional and national sources that included the Savannah Area Geographic Information System (SAGIS), Chatham County Emergency Management Agency (CEMA), Chatham County GIS, Federal Emergency Management Agency (FEMA) and National Oceanic and Atmospheric Administration (NOAA). Spatial data layers used in this analysis included but were not limited to administrative boundaries, natural features, parcels, local tax assessor records, building footprints, georeferenced point locations for identified assets (critical facilities and infrastructure) as well as digital orthophotography. This analysis also took advantage of the new Chatham County Digital Flood Insurance Rate Map (DFIRM) data as prepared by FEMA in 2008. The DFIRM is comprised of all digital data required to create the hardcopy FIRM including hydrography, flood hazard zones and base flood elevations.

FEMA's HAZUS-MH MR3 (Version 1.3) software was used to estimate potential losses in the core study area of Savannah resulting from potential flood hazard events. HAZUS-MH was used to identify and map potential flood problem areas, particularly those locations outside of FEMA's mapped Special Flood Hazard Areas as delineated through the new DFIRM data. After manipulating and importing a hydrologically-corrected Digital Elevation Model (DEM) obtained from SAGIS and CEMA, HAZUS-MH was utilized to estimate floodplain boundaries for 132 stream reaches with a drainage area of .25 square miles. The DEM data had been created from 1-foot contour data with a vertical accuracy of 6 inches as generated from a countywide airborne LIDAR survey completed in 1999. This DEM data is therefore significantly more accurate than the default DEM data (30-meter) from the National Elevation Dataset as obtained through the USGS and allowed for a higher level of confidence in the flood hazard analysis. The floodplain boundaries generated by the use of HAZUS-MH in combination with the local DEM were largely consistent with the FEMA delineated floodplains per the most recent Flood Insurance Study; however, in certain areas of the City the HAZUS-generated floodplain boundaries were more expansive. These expanded floodplain boundaries were confirmed to be flood problem areas according to further GIS analysis using the city's GIS database of historically reported flooding locations



Map 1 FEMA Special Flood Hazard Areas Overlaid with Historically Flooded Properties (Note: the red dots on each image are the location of properties with historically reported flooding events per the City's call center.)



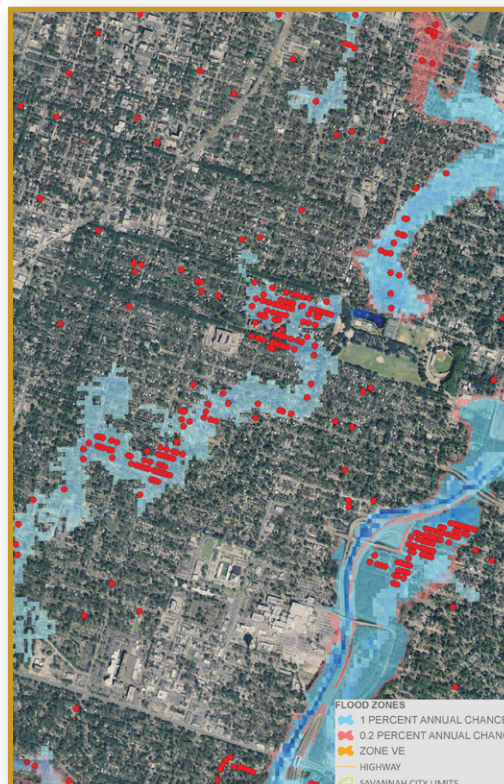
(these locations were reported by residents through the City of Savannah's Customer Service Call Center or by staff from the City's Stormwater Management Department, dating back to 1994).

Using default national inventory data aggregated to the census block, HAZUS-MH then calculated the potential exposure for each event frequency, and loss estimates based on probabilistic scenarios for 10-, 50-, 100-, and 500-year flood events. This includes figures for physical damage to the existing building stock and contents, as well as a number of other economic and income-related losses due to business interruptions. Flood extent and depth was calculated at the 90-foot pixel level for affected areas along with the proportion of area affected within each census block. Lastly, each of the scenario results were then normalized using updated (2007) assessed values for buildings per Chatham County's tax parcel database.

## Increasing Public and Stakeholder Involvement

The City of Savannah utilized several measures to solicit additional partners in the plan development process including a sustained public communication and outreach effort and the creation of multiple stakeholder committees. The project included a Steering Committee, a core group of City staff members who represented Community Development, Engineering, Stormwater Management and Real Property Services. The City also formed a Planning Advisory Committee consisting of a targeted group of relevant agency representatives. In addition there was a Stakeholders Advisory Committee which was a broad representation of outside agencies, business, non-profit organizations, academic institutions, media outlets, and neighborhood associations. Finally, the City sponsored a week-long Public Workshop Series for local residents and business owners which took advantage of cooperation of local media outlets and advocacy groups for widespread notification. At each workshop, property owners had the opportunity to learn about their level of potential flood risk and the range of possible hazard mitigation options to consider in minimizing or eliminating that risk.

As part of the City's public outreach and stakeholder involvement efforts, the City's planning team learned of multiple areas of concern that had experienced historical flooding. For those areas located outside of FEMA identified flood zones, HAZUS-MH helped the planning team validate, illustrate and analyze existing flood risks.



Map 2 HAZUS-MH Generated Floodplain Boundaries Overlaid with Historically Flooded Properties (Note: the red dots on each image are the location of properties with historically reported flooding events per the City's call center.)

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## Maximizing CRS Points Through Flood Mitigation Strategies

The National Flood Insurance Program's (NFIP) Community Rating System (CRS) is a voluntary incentive program that recognizes and encourages community floodplain management activities that exceed the minimum NFIP requirements. The City of Savannah has mitigated the flood hazard for many years, and currently participates in the CRS as a Class 8 community which provides a 10 percent reduction in flood insurance premiums for its property owners. As a result of this planning project, the City is scheduled to receive an additional 250 credit points and through plan implementation is aiming to improve to a Class 6 community, providing up to a 20 percent reduction in NFIP premiums. The use of HAZUS-MH in the City's CRS flood mitigation planning process increased awareness of existing and future flood hazard risks, and also helped to promote and build community support for a variety of ongoing and newly proposed flood hazard mitigation strategies adopted by the City to reduce or eliminate risks from riverine, coastal and urban flooding.

